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RESPONSE UNDER 37.CFR1.116
EXPEDITED PROCEDURE
EXAMINING GROUP 1754
AF/1754



IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

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: Confirmation No. 8103

Ola OLSVIK

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: Group Art Unit 1754

Filed March 16, 2001

: Examiner Jonas N. Strickland

METHOD FOR PREPARING A H₂-RICH GAS
AND A CO₂-RICH GAS AT HIGH PRESSURE

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RESPONSE AFTER FINAL REJECTION

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

Responsive to the Office Action of July 28, 2003, Applicant submits the following remarks in support of the patentability of the present invention over the disclosures of the references relied upon by the Examiner in rejecting the claims. Further and favorable reconsideration is respectfully requested in view of these remarks.

Thus, the rejection of claims 21-31 under 35 U.S.C. § 103(a) as being unpatentable over Pagani (CA 868821) is respectfully traversed.

This reference, which is cited on page 2 of the Specification and in the International Search Report, is evaluated as a prior art reference against the present invention in the International Preliminary Examination Report (IPER), a copy of which is of record. As indicated in the IPER, the Pagani reference (D1) is "not relevant for the inventive step (obviousness), because [it is] concerned with the production of hydrogen and carbon monoxide." This assessment of the Pagani reference is completely contrary to the position taken by the Examiner in rejecting the present claims as being obvious from this reference.

Thus, the present invention is directed to a method for preparing a CO₂-rich gas stream and a H₂-rich gas stream which involves subjecting a gas mixture of natural gas and H₂O to a

one-step reforming reaction under supercritical heat and pressure conditions for water to form a reformed gas mixture, and separating the reformed gas mixture into a H₂-rich gas stream and a CO₂-rich gas stream.

On the other hand, as most apparent from page 1 and claim 1 of Pagani, this reference is concerned with a steam reforming process for the production of a synthesis gas “of carbon monoxide and hydrogen” (claim 1), which is then used for the synthesis of ammonia and methanol (page 1, lines 17-21). Although the reactions shown on page 2 of the reference include CO₂ and the composition of the fumes and the transformed gas include CO₂, this is merely one component of these gases, referring again to the reactions in the paragraph bridging pages 1 and 2 of the reference. There is no separation of the “transformed gas” (page 4, line 11) into a H₂-rich gas stream and a CO₂-rich gas stream as required in the present invention.

The Examiner takes the position that it would have been obvious to separate a carbon dioxide rich gas stream and a hydrogen rich gas stream, since Pagani discloses wherein a hydrogen and carbon dioxide stream are produced. However, to the contrary, Pagani discloses that a transformed gas containing carbon dioxide and hydrogen is produced. The reference does not disclose or suggest that the transformed gas is separated into a carbon dioxide rich gas stream and a hydrogen rich gas stream. There is no motivation to conduct this separation. In fact, to the contrary, the object of the reference is to produce synthesis gas of carbon monoxide and hydrogen (page 1 and claim 1) for the synthesis of ammonia and methanol (page 1, lines 17-21). Separating the transformed gas resulting from the reforming reaction into a carbon dioxide rich gas stream and a hydrogen rich gas stream as argued by the Examiner would in fact defeat the very purpose of the process disclosed by Pagani.

Applicants also note that the Pagani reference relates to a conventional method of producing H₂ and CO₂ whereas the present invention regards the production of H₂ and CO₂ under supercritical conditions for water. The reference describes preparation of synthesis gas by steam reforming of hydrocarbons in a gas and liquid at 50-250 bar absolute atmosphere, preferably 160 bar absolute for production of ammonia and methanol. The reference does not disclose a one-step process for production of a CO₂-rich gas and H₂-rich gas under supercritical conditions for water (claim 21), where a CO₂-rich gas mixture is taken out at an elevated pressure in the interval from 20 to 200 bar (claim 25) for injection into marine formations (claim 37). The present invention

involves reduced compression costs and energy consumption by deposition or injection of the CO₂-rich gas stream because the CO₂-rich gas mixture is taken out at an elevated pressure. A main principle of the present invention is that the CO₂ is produced under supercritical conditions for the purpose of "Enhanced Oil Recovery" (EOR). The pressure range according to Pagani is 50 to 200 bar and the reference does not specify a temperature range. The present invention specifies a pressure range between 200 and 500 bar (claim 24) and a temperature range 400 to 600°C (claim 22). The present invention has defined a range for both temperatures and pressures which achieves supercritical conditions for the water. According to the present invention Applicant achieves an energy efficient and environmentally friendly source of carbon dioxide and hydrogen for use as shown in Figure 1 of the present application.

For these reasons, Applicant takes the position that the presently claimed invention is patentable over the Pagani reference.

The rejection of claim 32-36 under 35 U.S.C. § 103(a) as being unpatentable over Pagani further in view of Kapoor et al. (US 5,714,132) is respectfully traversed.

The comments set forth above concerning the Pagani reference are considered to be equally applicable for this rejection. Rejected 32-36 are all dependent, directly or indirectly, on claim 21, which is considered to be patentable over Pagani for the reasons set forth above. Therefore, even if the Kapoor et al. is combined with Pagani, the combination still does not suggest the presently claimed invention.

Applicant also notes that the Kapoor et al reference is discussed in the IPER referred to above. As in the case of the Pagani reference, the IPER also indicates that Kapoor et al. (D3) is not relevant because it is concerned with production of hydrogen and carbon monoxide.

Since the Examiner relies on Kapoor et al. only for the proposition that it would have been obvious to modify Pagani based on the teachings of Kapoor et al. by carrying out the reforming reaction without a catalyst, no further comments about Kapoor et al. are considered to be necessary.

The rejection of claim 37 under 35 U.S.C. § 103(a) as being unpatentable over Pagani further in view of Ronning et al. (US 5,832,712) is respectfully traversed.

The comments set forth above concerning the Pagani reference are equally applicable to this rejection.

Since the references have been combined by the Examiner only for rejecting claim 37, it is apparent that even if the references were combined, the combination would not suggest the present invention because, as indicated above, Pagani fails to suggest the subject matter of claim 21 on which claim 37 depends.

The rejection of claims 38-40 under 35 U.S.C. § 103(a) as being unpatentable over Pagani further in view of Beshty (US 4,946,667) is respectfully traversed.

The comments set forth above concerning the Pagani reference are equally applicable to this rejection.

Since claims 38-40 are all dependent on claim 21, and since claim 21 is directed to subject matter which is not suggested by Pagani as indicated above, it is apparent that even if the references were combined in the manner suggested by the Examiner, such a combination would still not suggest the present invention.

Therefore, in view of the foregoing remarks, it is submitted that each of the grounds of rejection set forth by the Examiner has been overcome, and that the application is in condition for allowance. Such allowance is solicited.

Respectfully submitted,

Ola OLSVIK

By: 

Michael R. Davis

Registration No. 25,134

Attorney for Applicant

MRD/jlg
Washington, D.C. 20006-1021
Telephone (202) 721-8200
Facsimile (202) 721-8250
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